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Dimethyl ether (DME) has recently emerged as a novel-solvent in water-flooding enhanced oil recovery (EOR), because it can be dissolved in both the oil and the water/brine phase. DME dissolves preferentially in the oil phase (first contact miscible), causing swelling and reducing the viscosity of the oil, thus improving its mobility. Dynamic modeling and DME enhanced water flood simulations require accurate phase description. The purpose of this work is to provide satisfactory modeling of the DME partitioning between the oil and the water/brine phases. Two models were used: the Cubic Plus Association (CPA) equation of state (EoS) and cubic EoS (CEoS) with Huron-Vidal (HV) mixing rules. Parameters for CPA and CEoS-HV were regressed for binary systems of DME with water, several HCs, carbon dioxide and nitrogen. Overall the results were satisfactory. Finally, predictions with CPA were made in ternary mixtures of DME/water/HC. DME/water required temperature dependent parameters to capture sufficiently the experimental data, whereas the rest of the systems needed only one temperature independent parameter. Analysis of the modeling results can provide beneficial information to the planning of core flood experiments.

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